

NASA Joint Sponsored Research Program



**Project Status Report
April 1994**



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For internal NASA use only

Submitted in partial fulfillment of Grant no. NCC2-648 and the Agreement between NASA and AmTech for implementation of the JSR Program.

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American Technology Initiative

THE MISSION

AmTech is an independent nonprofit organization dedicated to enhancing U.S. economic competitiveness through the formation of partnerships between creators and users of technology, and by researching, formulating and testing innovative methods to increase the commercialization of publicly-funded technology.

NASA Joint Sponsored Research Program

SCOPE

The NASA Joint Sponsored Research (JSR) Program is intended to: 1) foster the synergistic collaboration of NASA and the private sector in joint sponsored research in order to achieve R&D efficiencies through leveraging of NASA's R&D resources in aeronautical and space science and technology and their applications; and 2) accelerate technology transfer and commercialization.

NASA Joint Sponsored Research Program

REPORTING DEFINITIONS

1. R&D project complete - the project has been completed and the final reports delivered.
2. R&D in progress - the project research currently is underway.
3. In negotiation - the preliminary terms and conditions have been proposed by one of the potential participants, and negotiations are under way on those terms and conditions.
4. In preparation - the preliminary terms and conditions of an offer are being prepared by AmTech for possible negotiations.
5. Prospects - a potential project has been referred to AmTech and meets AmTech's minimum criteria. Additional information is being gathered to determine if it meets all criteria.
6. Rejected - the prospect has been reviewed and rejected, or the preparation and/or negotiations have failed.
7. Resource contributions - the total cash and in-kind resources committed by the parties to the completion of research over the anticipated life of the project.
8. In-kind resources - the estimated value of in-kind resources committed by the terms of the project agreement, and valued at cost.
9. Estimated resource contributions - the estimated resource contributions necessary from each participant to complete the research, according to the preliminary R&D plan submitted by the project applicant.

AmTech JSR Program Criteria

PROJECTS IN PREPARATION

Those projects which have been screened by AmTech and meet the following minimum criteria for investment of resources for development of a project:

- **Project:** A discrete project with a clear title, line of authority, and management review
- **Funding:** NASA funding is currently in place, and planned for at least two years
- **Importance of Research:** The research objectives are important to NASA; they clearly fulfill a mandated mission or program objective
- **Nonprofit Role:** There is currently a nonprofit institution involved, or the PI is prepared to delegate a portion of work to a nonprofit
- **Management Support:** The project is endorsed by NASA HQ managers
- **PI Support:** The PI supports the proposed JSR project effort
- **Cooperative Research:** The NASA referral manager believes there is strong interest in industry collaborative research
- **Intellectual Property/No Tech Transfer Blocks:** The IP is sufficiently clear to determine that there are no major blocks to transfer of existing or potential intellectual property

AmTech JSR Program Criteria

PROSPECTS

Those candidate projects originated by AmTech from NASA managers and industry representatives. Inclusion on the review list means that the following verbal representations have been made to AmTech:

- The candidate project is NASA funded
- There is a current or potential nonprofit research role
- There has been some form of industry interest in the technology
- The referring manager is committed to using the AmTech tech transfer vehicle in lieu of other tech transfer mechanisms

I. Project Results

Category/Project	# of Commercial Applications	Resource Contributions (\$K)			
		Cash		In-Kind	
		Fed	Non-fed	Fed	Non-fed
<u>A. R&D Project Complete</u>					
1. 8801-JSRA #1 (Mass Spec.)	1	359.2	269.5		
<u>B. R&D in Progress</u>					
1. 8901-JSRA #4 (ACSYNT)	1	620.0	784.0		
2. 9301-JSRA #6 (Paints)	2	462.7	165.0		221.0
3. 9211-JSRA #7 (Astro-ade)	1		62.0	5.0	22.2
Subtotal		1,441.9	1,280.5	5.0	243.2
<u>C. JSR R&D Collaboration Conversions (Documented)</u>					
1. 9206 (Water Purification)	1	135.0			
2. 9102 (Auto. Feedback Trng)	1	125.0	75.0		
3. 9101-JSRA #5 (Video Lumin. Barometry)	1	40.0	60.0		
4. 8910 (Crop Growth Res.)	1				
5. 8903-JSRA#3 (ADCACS)	1	550.0	904.0		
6. 8902-JSRA #2 (Chem. Sensor)	1				
7. 9319 (Telemedicine)					
<u>D. R&D Collaboration (Tech. Assistance)</u>					
1. 9303 (Remote Sensing/Phyllexora)	1	200.0	100.0		
2. 9302 (TRACON Software)	1	270.0			
Total		2,761.9	2,419.5	5.0	243.2

JSR Project Results

Technology Areas	Field Installation	Ames Research Center	Langley	Lewis
AERONAUTICS RESEARCH AND TECHNOLOGY BASE Aerodynamics R&T Propulsion & Power R&T Materials & Structures R&T Controls, Guidance & Human Factors R&T Flight Systems R&T Systems Analysis		JSRA5, JSRA6 JSRA3 JSRA4, 9302	JSRA6 JSRA4	 JSRA4
AERONAUTICS SYSTEMS TECHNOLOGY PROGRAMS High-Performance Computing/Numerical Aerodynamic Simulation Materials & Structures Systems Technology Rotorcraft Systems Technology High-Performance Aircraft Systems Technology High-Speed Research Advanced Subsonic Technology				
SPACE RESEARCH & TECHNOLOGY BASE Aerothermodynamics R&T Space Energy Conversion R&T Materials & Structures R&T Systems Analysis Space Automation & Telerobotics Information & Controls R&T Human Support R&T Space Communications R&T		JSRA2 JSRA1 8910, 9206, JSRA3, JSRA7		
SPACE SCIENCES Planetary Science Life Science Space Physics Atmospheric Sciences		9102, 9303, 9319		

**Joint Sponsored Research Agreement #1 (AmTech #8801)
Mass Spectrometer-Based Intelligent Systems Manager**

Status and Accomplishments

Partners: See accompanying chart.

Purpose: Extend capabilities of and miniaturize an ion trap mass spectrometer for feasibility demonstration on the Space Station and for new product development by commercial users. Originated from grant relationship between NASA Ames and University of Florida.

Agreement Terms: *Product/Research* - Research undertaken at U/F; NASA provided expertise and developed expert system software; Finnigan Corporation provided expertise and expert systems approaches to instrument control. *Deliverables* - Government received license to JSRA-developed software and license to background software developed by Finnigan; U/F received title to inventions and hardware from Finnigan; Finnigan received access to all data and exclusive license to U/F inventions.

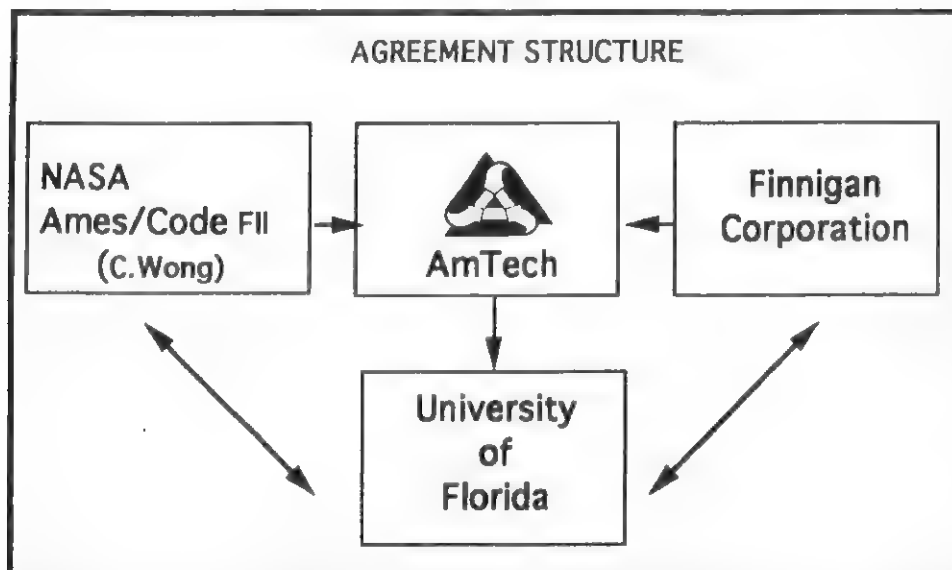
Status: 3-year research project completed in 1991.

Accomplishments: The first JSR Project funded by NASA; 14-month timespan from inception of R&D to commercial use of technology by Finnigan; JSR Project resulted in 4 patents and several copyrights within 3 years of project inception.

Unique or Unusual Features: Established and operated using funded Space Act (JSRA) mechanism; U/F contributed cash and in-kind resources, and reduced standard overhead rates.

Commercial Area/Technology Area: Intelligent systems technology.

Metrics: Collaboration resulted in 4 patents and several copyrights used by commercial participant.

"Mass Spectrometer Based Intelligent Systems Manager"

RESOURCE CONTRIBUTIONS		
	Cash	In-kind
NASA	\$359,163	Consultation; Expert system software
University of Florida	\$94,500	Professor and graduate student time, labs
Finnigan	\$175,000	Consultation, labs, equipment, background patent use

	ROLE	INTELLECTUAL PROPERTY RIGHTS	MISSION/COMMERCIAL APPLICATION
NASA	Consultation; develop expert system software.	Government license to inventions and software, including company background inventions.	Demonstrate feasibility of MS/MS mass spectrometer for Space Station use.
University of Florida	Extend capabilities of ion trap mass spectrometer and miniaturize mass spectrometer.	Receive title to University of Florida inventions.	Royalty income from licensing inventions.
Finnigan Corporation	Consultation; extend AI/ expert system approaches to instrument control.	Access to all data developed; first option to exclusive license on inventions by University of Florida.	Introduce product improvement & new product based on miniaturization & enhancement of mass spectrometer, stemming from 5 inventions made during JSR project.



**Joint Sponsored Research Agreement #4 (AmTech #8901)
The ACSYNT Institute**

Status and Accomplishments

Partners: See accompanying chart.

Purpose: Develop and improve (based on user feedback) aircraft design software; provide users the ability to integrate aircraft requirements at the conceptual design stage; research aircraft design problems. Consortium developed from original collaboration of ARC (Code FAS) and Virginia Polytechnic Institute (Aeronautical Engineering Department).

Agreement Terms: *Product/Research* - Government leverages funding; works closely with airframe and engine manufacturers on future direction of design standards; receives feedback from industry users on design software. Industry leverages funding; has direct access to research performed at NASA centers; receives software support offered by the Institute. University obtains use of ACSYNT to support course work and research; obtains technical knowledge; students interact with government and industry researchers. *Deliverables* - to the government and Institute members: yearly software updates, continuing software support and maintenance.

Status: Currently in the final year of a planned five-year consortium. Consortium members have included major U.S. airframe and engine manufacturers, university aeronautical engineering departments, NASA and the Navy. TRP funding requested in 1993 to commercialize ACSYNT software.

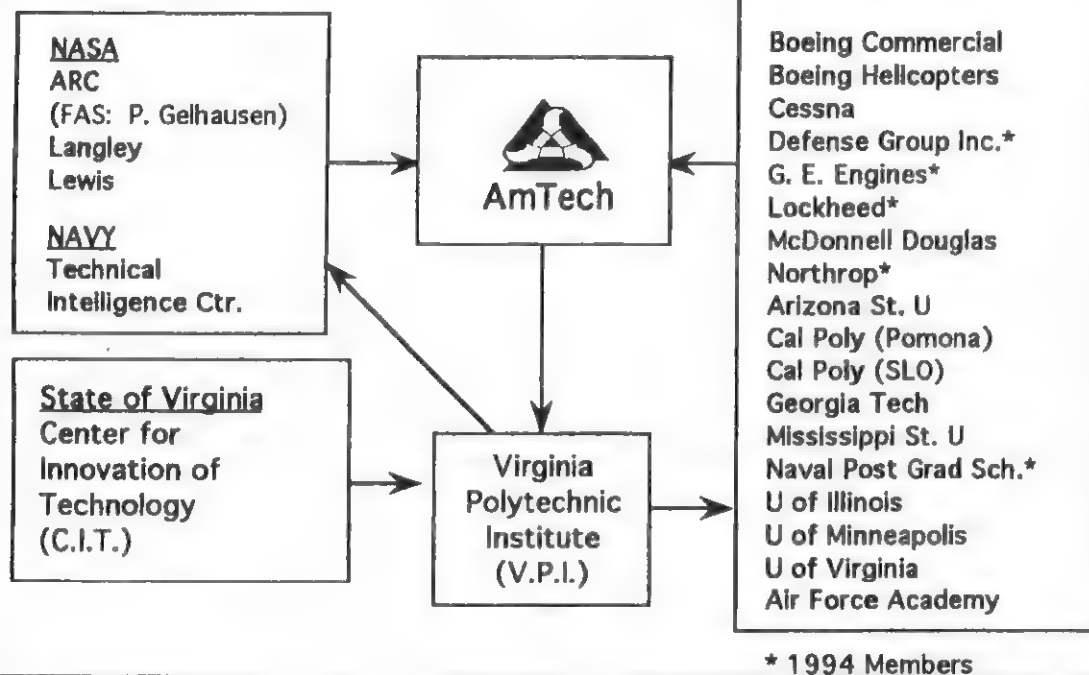
Accomplishments: ACSYNT has become the predominant software tool used by the consortium members for aircraft design. This JSRA was the first consortium arrangement for joint R&D by multiple private and public sector participants.

Unique or Unusual Features: Consortium was established and operates using funded Space Act (JSRA) mechanism; continuous user feedback is designed to improve the software through direct access to Institute researchers by the members and through semi-annual meetings of Institute members.

Commercial Area/Technology Area: Aerospace systems analysis and design.

Metrics: Institute has provided graduate student research positions at VPI for the past 4.5 years; ACSYNT software has become industry standard and has been incorporated in-house by several Institute members.

AGREEMENT STRUCTURE

*"The ACSYNT Institute"*

	RESOURCE CONTRIBUTIONS	
	Cash	In-kind
NASA/Navy	\$ 620K	Two (2) full-time programmer/analysts
V.P.I. C.I.T.	\$ 84K \$ 47K	One year professor & graduate students' time; labs & equipment
Members	\$ 778.5K	Company developed codes

	ROLE	INTELLECTUAL PROPERTY RIGHTS	MISSION/COMMERCIAL APPLICATION
NASA	Develop portions of analysis code and co-direct research and software development.	Government license to ACSYNT software (including software generated by VPI & contributed by members).	Develop software for NASA aeronautics missions, High Speed Research Program (HSRP) and High Performance Aircraft.
Virginia Polytechnic Institute (V.P.I.)	Research aircraft design problems; develop software; develop user-friendly version of ACSYNT; support members' ACSYNT use.	Own copyright to ACSYNT software.	ACSYNT Institute based at VPI. Spin-off company to perform maintenance & support of ACSYNT software.
Consortium Members	Provide user feedback; optionally, develop and contribute code to ACSYNT Institute.	License for inhouse use of software.	ACSYNT is becoming companies' predominant software tool for aircraft design, and emerging as industry standard.



**Joint Sponsored Research Agreement #6 (AmTech #9301)
Video Luminescent Barometry ("Paints")**

Status and Accomplishments

Partners: See accompanying chart.

Purpose: Develop an integrated system for measuring aerodynamic parameters (pressure and temperature) based on video luminescent barometry technology (e.g., combination of oxygen quenching coatings, imaging systems and software permitting the measurement of air pressure and other aerodynamic parameters on smooth surfaces). Original collaboration of all participants arranged by AmTech in 1991 using unfunded Space Act Agreement mechanism (MOA).

Agreement Terms: *Product/Research* - government provides wind tunnel tests, and software and protocol development; Boeing also provides testing facilities; University of Washington manages project and provides chemistry research. *Deliverables* - chemical formulations of paints that demonstrate improvements in aerodynamic data; chemical samples of coatings; improvements to data acquisition and analysis software.

Status: Currently in the first year of a 3-year research effort.

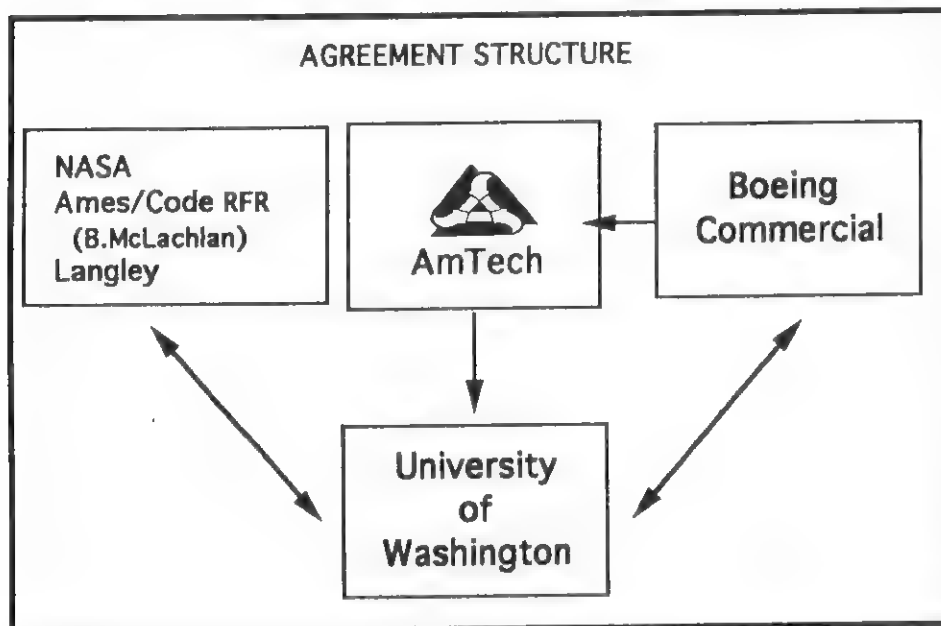
Accomplishments: Conversion by AmTech of unfunded MOA plus NASA grant to U/W into Joint Sponsored Research Agreement.

Unique or Unusual Features: Established and operated using funded Space Act (JSRA) mechanism.

Commercial Area/Technology Area: Fluid dynamics technology and chemistry.

Metrics: Collaboration halted Boeing's efforts to seek similar technology overseas.

Video Luminescent Barometry ("Paints")



RESOURCE CONTRIBUTIONS		
	Cash	In-kind
NASA	\$462,700	2 full time researchers/analysts; yearly test in large tunnel; 16 pieces of equipment loaned to UW
University of Washington		\$143,200 overhead reduction \$77,800 for 1 graduate student and 4 months professor salary
Boeing	\$165,000	1 full time research/analyst 1 yearly test in transonic tunnel

	ROLE	INTELLECTUAL PROPERTY RIGHTS	MISSION/COMMERCIAL APPLICATION
NASA	Small scale sensor test Large scale sensor test Software development Protocol development	Fully paid, government use license Royalty/fee reimbursement for commercial test use	Government - data generation for government aircraft development Commercial - service for reimbursable wind tunnel use
University of Washington	Basic chemistry research Sensor development Sensor bench test Project management	Patent holder for sensor Licensor of sensor for usage fees	Investigating market demand for separate spin off company to support product
Boeing	Large scale test Comparison w/alternative systems	Fully paid, unlimited commercial use license	Generate pressure & temperature data for aircraft development Reduce by 80% use of pressure tops



**Joint Sponsored Research Agreement #7 (AmTech #9201)
High Capacity Fluids ("Astro-ade")**

Status and Accomplishments

Partners: See accompanying chart.

Purpose: A research program to provide a rehydration drink that will result in increased efficiency of astronauts during extravehicular activity and that will modify and enhance commercially marketed fitness drinks. Project based on collaboration of NASA Principal Investigator with university and corporate participant on research plan in early 1993.

Agreement Terms: *Product/Research* - government will manage the research project and monitor protocol conditions, and will provide NASA formulations of rehydration drinks; Shaklee will provide drink formulations; Bionetics Corp. and SFSU will recruit and test subjects and provide raw data. *Deliverables* - government receives right to use test data and Shaklee receives option for exclusive license of NASA drink formulation.

Status: Currently in the first year of a 3-year research effort.

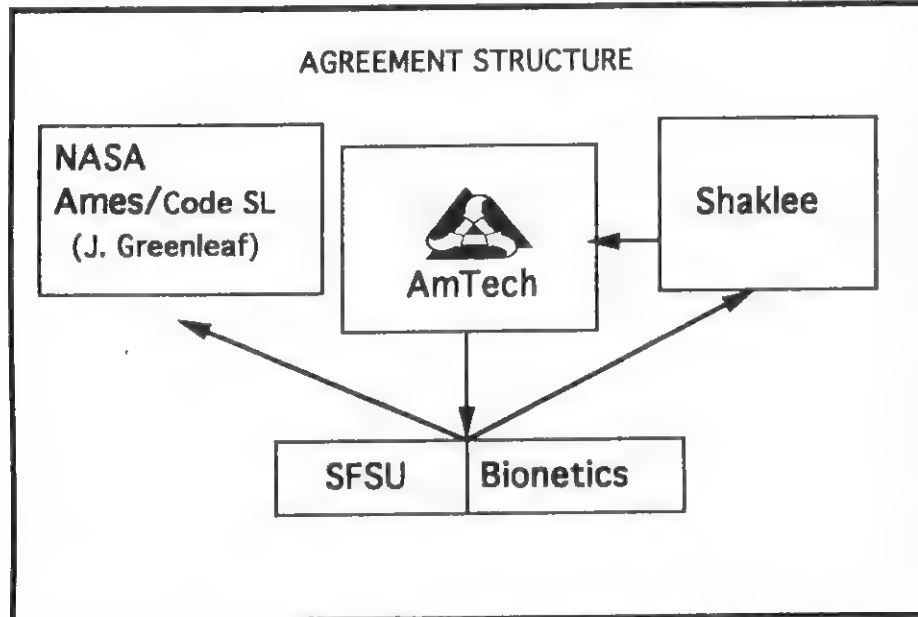
Accomplishments: Conversion by AmTech of unstructured collaboration into Joint Sponsored Research Project.

Unique or Unusual Features: The JSRA uses a for-profit laboratory (Bionetics), in addition to a university, for research and testing.

Commercial Area/Technology Area: Life sciences technology.

Metrics: TBD

High Capacity Fluids ("Astro - ade")



RESOURCE CONTRIBUTIONS		
	Cash	In-kind
NASA		\$5K/per annum supplies 50% researcher per annum Lab facilities
Bionetics SFSU		\$22.2K overhead reduction; 3 months per annum professor salary
Shaklee	\$ 62,043	25% researcher time Sample production

	ROLE	INTELLECTUAL PROPERTY RIGHTS	MISSION/COMMERCIAL APPLICATION
NASA	Protocol conditions Project management Report preparation	Unlimited government use of test data Patent of NASA formulation	Enhanced rehydration fluids for astronaut re-entry
Bionetics SFSU	Recruit subjects Execute tests Provide raw data to NASA/Shaklee	No IP rights	Publications for SFSU researchers
Shaklee	Provide 3 comparative drink formulations	Option for exclusive commercial license of NASA formulation	Modification, enhancement of commercially marketed fitness drinks



II. JS Objects Under Development

	Potential Partners			Proposed Resource Contributions (\$K)			
	NASA/ Federal	Commercial/Other Participants	Est	Cash		In-kind	
				Fed	Non-fed	Fed	Non-fed
A. Negotiation							
9333 - AGATE Alliance	NASA/FAA						
1. Propulsion and Sensors	LeRC	12	*	3,400		600	4,000
2. Integrated Design Manufacturing	LaRC	8		15,200		1,000	13,000
3. Cockpit Displays & Computer Systems	ARC	14		6,400		2,200	7,600
4. Integration Platform	LaRC	3		8,400			8,400
5. Icing Protection	LeRC	6		4,000		2,000	6,000
6. Expert Systems	ARC	7	*	2,640			2,600
7. Training Systems	ARC	6	*	2,640			2,600
8. Flight Controls	LaRC	8	*	2,680			2,700
9335 - ERAST Alliance for UAV	DFRC	5		55,000			TDB
9309 - Biofilms	ARC/NSF	11	*	1,350	450	200	100
9211 - Astro-ade II		1		10	55		
Subtotal		81		101,720	505	6,000	47,000

II. JS Objects Under Development

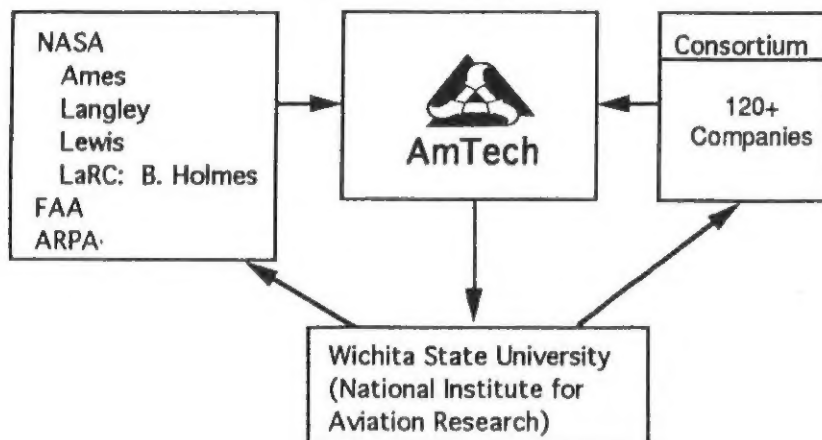
	Potential Partners			Proposed Resource Contributions (\$K)			
	NASA/ Federal	Commercial/Other Participants	Est	Cash		In-kind	
				Fed	Non-fed	Fed	Non-fed
B. In Preparation							
9334 - Rotorcraft	ARC/Army	4					
Subtotal		4		0	0	0	0
C. Prospects							
Advanced Life Support							
1. 9315 - Super Critical H2O	ARC	1		60			
2. 9328 - Computer Optical Switches	ARC	1					
3. 9329 - Standard Grid Generator	ARC	1					
4. 9310 - H2O Purification-Vapor Compressor	ARC	1		30			
5. 9316 - Air Purification	ARC	1					
6. 9306 - Rotor Stater Code	ARC	1		80			
7. 9301 - Aircraft Life Support	ARC	1					
8. 9336 - Variable Thermal Insulation	ARC	1					
9. 9204 - MEDSAT/Remote Sensing-Lyme Control	ARC	1		75			
10. 9305 - CO2/Multigas Sensor	ARC	2		40			
11. 9324 - HazMat Vehicle	ARC	1				75	220
Subtotal		12		285	0	75	220
Total		97		102,005	505	6,075	47,220

JSR Project Development

Technology Areas	Field Installation	ARC	DFRC	GSFC	JSC	KSC	Langley	Lewis	Marshall	JPL	SSC
AERONAUTICS RESEARCH AND TECHNOLOGY BASE		9301 9333					9333	9333			
AERONAUTICS SYSTEMS TECHNOLOGY PROGRAMS		9306 9328 9329 9335	9335				9335				
SPACE RESEARCH & TECHNOLOGY BASE		9204 9309 9315 9324 9336 9401 9402								9210	
SPACE SCIENCES		9211 9305 9310 9316									

General Aviation Technology Consortium

AGREEMENT STRUCTURE (under development)



RESOURCE CONTRIBUTIONS (estimated)

	Cash		In-kind
NASA/FAA	\$41.1M thru FY99	+	background technology, facilities, equipment, technical leadership
University	TBD	+	site of consortium organization
Industry Consortium	TBD	+	background technology; facilities, equipment; technology leadership

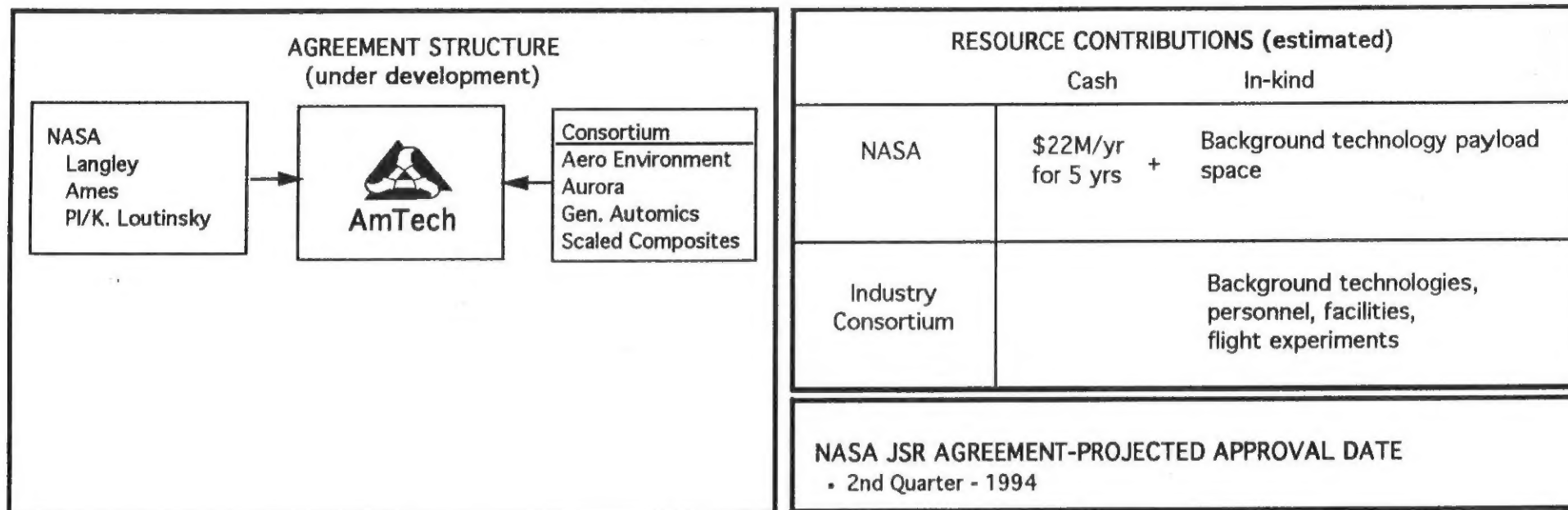
NASA JSR AGREEMENT-PROJECTED APPROVAL DATE

- 8-9 Individual JSRA's expected
- 2 JSRA's - 2nd Quarter 1994
- 6-7 JSRA's - 4th Quarter 1994

	ROLE	MISSION/COMMERCIAL APPLICATION
NASA	Provide background technology Project management	<ul style="list-style-type: none"> • Integration of flight cockpit technology; icing protection systems; integrated design and manufacturing, crash worthiness • Establish design guidelines, system standards and bases and methods for certification of interest to all parties
University	Provide consortium organizational elements	
Industry Consortium	Provide beta testing of technology	



Unmanned Aerial Vehicle Technology Consortium



	ROLE	MISSION/COMMERCIAL APPLICATION
NASA	Stimulate fledgling UAV airframe industry by providing support for resolution of key technical problems and demo of high altitude, long duration platform	<ul style="list-style-type: none"> Platform for high altitude research; mission demonstrations
Consortium	Technology development addressing, inter alia <ul style="list-style-type: none"> • Propulsion systems • Systems analysis • Materials and structures • Aerodynamics • Sensors 	<ul style="list-style-type: none"> Integration of technical solutions into UAV's under development by companies Market applications TBD



OTHER AMTECH ACTIVITIES*

- **The HPCC Program**
 - ARPA has completed its funding commitment to the HPCC Program; further funding is contingent on NASA support of AmTech's HPCC Program efforts.
- **BMDO has committed funding to AmTech for technology commercialization assessment and planning**
- **Pursuing additional funding opportunities from Code R for the JSR Program**
- **NASA has requested additional technology commercialization services from AmTech**

* provided as a courtesy to NASA JSR Program management

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